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ABSTRACT

A study was conducted by an electronic bulletin board system (BBS) team to explore a variety of approaches to electronic communication between the Government Printing Office's (GPO) Library Programs Service and the depository libraries. After reviewing various dissemination technologies, the BBS team recommended that an electronic bulletin board system become the Federal Depository Library Program's (FDLP) telecommunications vehicle of choice. It also recommended that the FDLP BBS be established by using existing Project Hermes hardware and software, a telecommunications vehicle currently used in the electronic dissemination of Supreme Court slip opinions. This report provides an executive summary, a discussion of the study methodology and study recommendations, descriptions of the FDLP and of the general characteristics of bulletin board systems, and a profile of the FDLP BBS, including its file characteristics and size, usage characteristics, staffing, telecommunications, system configuration options and costs, and an implementation schedule. Concluding the report are a 12-item bibliography, the Depository Library Council recommendations, the names and addresses of the study consultants, suggestions for the BBS file content, and a discussion of alternative dissemination technologies, i.e., online services, electronic mail, fax technology, and direct media dissemination. (MAB)

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for the

Federal Depository Library Program: A Study

Library Programs Service

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Electronic Bulletin Board System for the Federal Depository Library Program

A Study

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Preface

A preliminary draft of "Electronic Bulletin Board System for the Federal Depository Library Program: A Study" was completed on October 15, 1990 and presented to the Public Printer for approval.

The Public Printer concurred with the report's recommendations and advised the Library Programs Service (LPS) to proceed with implementation of the Federal Depository Library Program Bulletin Board System (FDLP BBS) as follows:

- the FDLP BBS will share the bulletin board software and hardware originally purchased to support Project Hermes (electronic dissemination of Supreme Court slip opinions);
- the FDLP BBS will be implemented incrementally with regard to both functionality and the number of users;
- the first functions to be implemented are E-Mail and time-sensitive short messages from LPS;
- the system will be beta tested with the 54 regional depositories before being made available to all depository libraries.

During the fall of 1990, beta testing of Project Hermes took place with regional and law libraries in the depository program. Based on the results of this test, LPS deems it advisable to re-locate the Project Hermes platform to LPS before mounting the FDLP BBS on it. With the addition of a technical specialist to LPS staff, LPS will be able to coordinate communications and provide timely user assistance for both Project Hermes and the FDLP BBS.

The report which follows represents a significant effort on the part of the BBS Project Team and numerous consultants (listed in Appendix B). The U.S. Government Printing Office and the Library Programs Service wish to thank those who gave so generously of their time in order to prepare this study.

Electronic Bulletin Board System for the Federal Depository Library Program

I. Executive Summary and Recommendations

A. Summary

GPO's Library Programs Service staff, the Depository Library Council to the Public Printer, and members of the depository library community have expressed a strong need for electronic communication between the Library Programs Service and the depository libraries. Electronic mail (E-Mail) and bulletin board systems (BBS) were targeted as the most appropriate vehicles for electronic communication. Since bulletin board systems include E-Mail, but E-Mail systems do not include all the functions available in bulletin board systems, the BBS Project Team concentrated its investigations on bulletin board systems.

Any BBS system implemented must allow delivery to all areas of the United States and its territories, preferably through local access telephone lines. System requirements include 2- way file transfer, messaging of bulletins to the universe of users, and E-Mail. Time-delay and Fax distribution would be attractive options.

The answers to two questions are critical to the success of the Federal Depository Library Program Bulletin Board System (FDLP BBS): what telecommunications vehicle should be chosen, and who will pay? If depositories must pay their own telecommunications costs, a local telephone access path must be available to them, or many of the libraries might not be able to participate in the system. Though GPO could install an 800 number to access the system, it seems unlikely that appropriations to cover its cost of close to $1 million a year would be approved by Congress. Use of an online service or a packet switching network would provide low-cost access to the FDLP BBS.

B. Recommendations

The BBS Project Team recommends that the FDLP BBS be established using the existing Project Hermes hardware and software. The Hermes platform is currently mounted in GPO's Production area, and the hardware and software are dedicated solely to Hermes. Because of the greatly increased message traffic expected with use of the FDLP BBS, the BBS Project Team recommends that the Project Hermes platform be moved to LPS before adding the FDLP BBS to it. LPS would need to add a technical specialist to its staff to act as bulletin board administrator and systems operator. This avenue would make effective use of excess capacity in Hermes, and minimize LPS hardware and software costs. LPS hardware and software purchases for an FDLP BBS sharing the Hermes platform would run to $4,716, as opposed to $40,164 for a fully backed-up new system established in LPS.

The BBS Project Team further recommends that a request for proposals be issued to invite packet switching networks and online services to examine the FDLP BBS and submit proposals on its implementation. Alternatively, a depository in the local Washington D.C. area that was already a member of a network (Internet, for example) could download the files on the BBS and make them available to other network members.

The FDLP BBS should be implemented gradually. Content should initially be limited to short text files and tested with the 54 regional libraries. Additional files could be added as each step was successfully completed. Once the preliminary system was operating satisfactorily, access could be broadened to include all 1400 depositories.

The BBS Project Team further recommends that the system be evaluated after it has been fully implemented for at least six months. If sharing the Hermes platform seems likely to be adequate for the needs of the FDLP BBS for the foreseeable future, and if the system is functioning smoothly, the FDLP BBS could continue to share a common platform with Hermes. If the shared arrangement proved to be inadequate or too cumbersome, LPS could explore the possibility of contracting with an online system.

In any event, the test period would provide valuable telecomputing experience to LPS staff. The test period would also demonstrate actual usage levels, which might prove to be far different than the estimates.

Expected developments within LPS should add to the amount of information in electronic formats over

the next few years. The BBS Project Team believes that whatever options are chosen, a system can be established that will serve the present needs of the Depository Library Program and be able to expand to accommodate future developments.

II. Introduction

A. Federal Depository Library Program

In accordance with Title 44 of the U.S. Code, GPO administers the Federal Depository Library Program (FDLP), which is managed by the Library Programs Service (LPS) under the direction of the Superintendent of Documents. The Federal Depository Library Program provides free government publications to almost 1400 depository libraries, which in return are obligated to allow the general public free access to the publications. The Federal Depository Library Program includes academic, public, federal, court, and special libraries throughout the United States and its possessions.

The Depository Library Council to the Public Printer, consisting of 15 representatives from the government information community, provides advice to GPO on issues facing the program. The Council meets in the spring and fall of each year.

B. Basis of the Study

At its spring 1990 meeting, the Depository Library Council requested that GPO implement three basic electronic services for depository libraries:

1) Bulletin, or messaging, capability, to enable LPS to provide timely notification of urgent information;

2) File exchange, to enable LPS to provide files in electronic format, such as shipping lists, to depository libraries, and

3) Electronic mail (E-Mail).

(See text of Council recommendations in Appendix A.)

At the June 1990 American Library Association conference, the Public Printer affirmed GPO's intention to provide Administrative Notes, LPS's newsletter directed to depositories, on an electronic bulletin board system (BBS).

C. Scope of the System

LPS management made several initial decisions regarding system parameters:

1) The system will be available to depository libraries only;

2) The system will be available to all depositories in the United States and its territories;

3) The system will contain administrative information directly relating to the Depository Library Program;

4) The system will be expandable, so that increased use and more applications can be readily accommodated.

D. Study Methodology

In order to study options and prepare a report, LPS assembled a BBS Project Team whose members are the Depository Services Chief, a Depository Library Inspector, the Office Automation Specialist, and the Publications Librarian. The BBS Project Team compiled data from several sources as listed below:

1) surveys of LPS staff;

2) surveys of the 15 members of the Depository Library Council;

3) surveys of the six members of the ALA/GODORT Government Information Technology Committee;

4) consultation with various BBS experts;

5) examination of published literature on BBS hardware, software, and system design;

6) hands-on use of several local BBSs.

The Team's goal was to explore a variety of approaches to electronic dissemination of information, to determine which approach would best accomplish the desired tasks. In addition to electronic bulletin board systems and electronic mail, the team investigated Fax (telefacsimile) technology, direct media dissemination, such as CD-ROM, and the possibilities offered by existing online services. See Appendix D for discussions of online services, E-Mail, Fax technology, and direct media dissemination.

Having reviewed these technologies, the BBS Project Team concluded that an electronic bulletin board system would best meet the requirements of the depository libraries. It alone provides all the services considered essential by all the parties consulted in the course of the study. Bulletin board systems normally include E-Mail. E-Mail systems alone, however, do not easily permit all of the other functions common to bulletin board systems. (See discussion of E-Mail in Appendix D.)

III. Bulletin Board Systems - General Characteristics

A bulletin board system is a public or private meeting place for the exchange of information, just like a physical bulletin board. Bulletin board systems can be implemented using special software and hardware, on most widely used personal computer models. They can also be implemented as a feature of many online computer services. However they are implemented, bulletin board systems generally offer a standard group of services to members. These are:

- E-Mail;
- Conferencing between special interest groups;
- Bulletins and Notices;
- File exchange (Libraries of data files available for upload and download to members);
- Doors to special programs, to assist or entertain members.

Three of these services, bulletin capacity, file exchange, and electronic mail, were specifically requested by the Depository Library Council at its spring 1990 meeting.

Advantages of BBS

A. BBS meets all of the functional requirements LPS has established for communication services, i.e., messaging capacity, file exchange, and E-Mail.

B. Timely, low cost transfer of data is possible to most of the depository community.

C. While BBS software is specific to the type of operating system in use, BBS's can be accessed by any microcomputer user who has compatible communications software and a phone modem. This allows incompatible microcomputer types to exchange information.

D. A BBS can be implemented either on a microcomputer or as a part of a larger online service. This flexibility of implementation is an important asset, since it allows LPS to adjust its implementation to various factors.

Analysis

Bulletin board systems have become a common fixture in the computer community. There is considerable expertise available for the proper operation of BBS. The BBS forum offers a centralized contact point for all LPS/Depository activities and concerns, and a BBS can be customized so that the messages and data files are organized to provide the best possible service to all parties.

1) Bulletins - The major feature of BBS. Bulletins and Notices would be presented to all participants.

2) E-Mail - Another major feature of BBS. Messages can be addressed to individuals and general groups. Messages can be sent from LPS to libraries, and libraries can also send messages among themselves.

3) Conferences - Another feature of BBS. Special interest groups can be established to deal with any situation.

4) File Exchange - File libraries are another standard feature of BBS. Exchange can be in both directions. In addition, online use of established data files and other helpful programs could be implemented.

A bulletin board system provides the most comprehensive methodology for disseminating timely, machine-readable information to the depository community. The Federal Depository Library Program BBS (FDLP BBS) could be limited in scope initially, both in content and in the user base, to determine user interest and to work out any problems. As use and interest grew, the system could be expanded.

Hardware and Software for BBS

A microcomputer based BBS platform will require the following hardware and software:

- 1 dedicated IBM-compatible PC
- 1 backup PC
- 1 modem
- 1 expansion chassis with multiple internal modems
- 1 rack mount cabinet
- 32 dedicated phone lines (to accommodate up to 32 simultaneous users)
- BBS software (includes telecommunications software)
- 1 removable hard disk (to re-install in backup PC)
- 1 printer

The libraries at the receiving end will need the following:

- 1 PC
- 1 modem
- 1 phone line with RJ11 type plug
- telecommunications software compatible with BBS software
- 1 printer.

For a more detailed discussion of hardware and software, see Appendix E.

IV. FDLP Bulletin Board System - System Description

A. File Characteristics and Size

When fully implemented, the FDLP BBS will include three basic functions:

1) File transfer;

2) Correspondence between LPS and depositories, and among depositories;

3) Data-gathering by LPS.

LPS staff, together with Depository Library Council members, ALA GODORT Government Information Technology Committee members, and other respondents, provided numerous suggestions for file content of the FDLP BBS. Those suggestions that conform to the basic scope of the project (administrative information directly relating to the Depository Library Program) are listed in the tables below. File size, in terms of lines added per week, 80 characters per line, has been estimated for each file. (For a complete list of suggestions received, see Appendix C.)

The tables below show the files; their estimated size, expressed in number of new lines added per week where possible; the basis for calculating the estimated number of lines, and file characteristics.

File Transfer		
File Name	**Lines per Week**	**Basis and Characteristics**
GPO-generated		
Administrative Notes	300	1 issue every 2 weeks; avg. 600 lines @. Mixture of short texts, longer articles, some numerical data.
Shipping Lists	430	Ca. 8 lists/wk.; avg. 54 lines @. Alphanumeric strings plus text.
Correction Shipping Lists	20	Ca. 12 lists/yr.; avg. 80 lines @. Alphanumeric strings plus text.
Monthly Catalog Corrections	5	Ca. 20 lines/mo. Alphanumeric strings plus text.
Bulletins	5	Ca. 1 bulletin/wk.; avg. 5 lines @. Text.
Depository-generated		
Needs and Offers List	1,800	Ca. 2 lists/mo.; avg. 90 p. @, avg. 40 lines/page Alphanumeric strings plus text.
TOTAL	2,560	

Table 1. In order to be useful to LPS and depositories, data in shipping list, correction shipping list, and needs and offers list files should be offered in a structured format.

Correspondence		
File Name	Lines per Week	Basis and Characteristics
Inquiries from Depositories	1,500	Ca. 300 inquiries/wk.; avg. 5 lines @. Text.
LPS Responses	1,000	Ca. 200 responses/wk.; avg. 5 lines @. (Many classification inquiries are duplicates.) Text.
Claims	2,800	Ca. 1400 claims/wk.; avg. 2 lines @. Alphanumeric strings and text.
TOTAL	5,300	

Table 2.

The files shown in Tables 1 and 2 above total 7,860 new lines per week. Most data would remain on the system for one month. Each week, approximately 8,000 lines of the oldest data would be deleted and 8,000 lines of new data would be added.

File sizes for data gathering, shown below, cannot be expressed in lines per week, because these activities take place annually, biennially, or sporadically throughout the year. The figures below are based on the best available estimates.

Data Gathering		
File Name	Lines	Basis and Characteristics
Biennial Survey	112,425 every 2 years	LPS sends survey of 425 lines. Ca. 1400 libraries respond with ca. 80 lines @. Text; multiple-choice questions.
Item Selection List	91,000/yr.	Annual survey. Avg. 65 changes per library, ca. 1400 libraries. Numerical.
Item Surveys	14,000 every 2 months	Avg. 6 surveys/yr.; avg. 10 lines @. Text plus numbers.
Other surveys	14,000 every 4 months	Avg. 3 surveys/yr.; avg. 10 lines @. Text; check-off boxes.

Table 3. In order to be useful to LPS, data in these files should be offered in a structured format.

B. Usage Characteristics

Cost estimates on the following pages are based on the assumption that all of the nearly 1400 depository libraries would actively use the FDLP BBS. Full participation, i.e. all depositories accessing all the files, would probably entail no more than 1.5 hours of connect time per library per week (assuming average baud rate of 2400), for a total of 2,100 hours per week. LPS might require system access for two hours a day, or 10 hours a week.

At this level of use, there might easily be 20 to 30 simultaneous users. Since telecommunications software is commonly equipped to handle telephone lines in multiples of eight, the system should ultimately support 32 dedicated phone lines.

C. Staffing

Many of the tasks proposed for the bulletin board are already performed by LPS staff. Any increased staffing needs would therefore be related to extra steps in the workflow imposed by the BBS. Support activities would include file maintenance and transfer, printing, and maintaining various BBS-related lists such as password lists.

According to several BBS managers consulted in the course of this study, setting up the BBS requires the full-time attention of an experienced person for at least several weeks. Thereafter, routine upkeep tasks can be managed at the technician or clerical level. At the Department of Commerce, for example, the Economic Bulletin Board requires two people half-time to maintain the files on the system on a daily basis. The Economic Bulletin Board provides essentially one- way communications.

LPS's interactive system would require more staff time to monitor incoming messages, route them to the appropriate party, and coordinate replies. Much of this work is already performed, as inquiries and replies are currently sent by mail or Fax. If the FDLP BBS is set up on one computer, however, all of these inquiries, messages, and files will come into one central location. It would require at least one full-time person to manage the communication flow and to load the daily files, as well as manage the file upkeep mentioned above.

In addition, an experienced technical person would need to work on the system from time to time, as problems arose or changes in the system were required.

D. Telecommunications

Three primary telecommunications avenues are available to access the BBS:

1) Regular phone services,

2) Packet switching networks, and

3) Online services (includes services other than telecommunications).

Since most of the calls coming into the BBS would originate outside the Washington, D.C. local calling area, using regular phone service would require the libraries to pay long-distance charges. Alternatively, if funds were approved, GPO could install an 800 number and absorb the long-distance costs. GPO staff have calculated the cost to GPO of an 800 number installed through its regular phone service, at an average cost of $8.40 an hour. .

Packet switching networks reduce costs through the use of high-efficiency equipment and high-volume. (See section on Telecommunications in Appendix E for more details.) Two of the best known commercial packet switching networks are Tymnet and Sprintnet (formerly Telenet). These networks have different charges for different services which together total an average of $6 to $15 per hour, depending on location, volume of data, and transmission speed. Each depository would subscribe to the service individually, or, alternatively, arrangements could be made through GPO, which could then bill telecommunications charges back to the libraries.

Two major communications networks serving universities and other research centers, Bitnet and Internet, use packet switching networks to reduce costs. As Bitnet offers only electronic mail, however, it does not provide a viable vehicle for the FDLP BBS. Internet does have bulletin board capacity.

Although associated with academic and research centers, Internet allows access to other institutions, if they make formal arrangements with the local Internet member. Access to the FDLP BBS would then be through a local call to a near-by college or university subscribing to Internet. Costs to the depository library might be absorbed by the university, or they might be passed on to the depository, according to the individual arrangement. Each library would make its own arrangements with the nearest Internet member. Costs

would vary, but the $5.00 per hour that NIH (National Institutes of Health) is charging members of its newly set up umbrella bulletin board service might be typical. Academic libraries whose institutions are not already Internet subscribers would pay annual dues and fees as well as communications and connect charges. (See Appendix E for a discussion of Cleveland Free-Net, another bulletin board service on Internet.)

There are many online commercial services which specialize in bulletin boards and provide the reduced telecommunications costs of the packet switching networks. Two well-known online services are Compuserve and Byte Information Exchange (BIX). Compuserve telecommunications charges are $12 per hour for the contiguous United States, and $50 for overseas. BIX charges $20 per hour during peak times, and $11 per hour for weekends and holidays. It should be noted that services other than telecommunications are included in these charges.

Telecommunications costs in the chart below are figured on the basis of 1.5 hours per library per week at $8.40 an hour for an 800 number at GPO, at $11 and $20 an hour with an online service, and at $6 and $15 with a packet switching network.

Telecommunications Costs	Low End	High End
800 line billed to GPO annually. $8.40/hr.	$ 917,280	$ 917,280
Online service billed to GPO annually. Low=$11/hr.; High=$20/hr.	1,201,200	2,184,000
Online service billed to each library annually. Low=$11/hr.; High=$20/hr.	858	1,560
Packet switching network billed to GPO annually. Low=$6/hr.; High=$15/hr.	655,200	1,638,000
Packet switching network billed to each library annually. Low=$6/hr.; High=$15/hr.	468	1,170

Table 4.

E. System Configuration Options and Costs

Although there are numerous options resulting from various combinations of equipment/software/telecommunications access/administrative arrangements, the following configurations seem to be the most practical:

1) Dedicated microcomputer in LPS - Run by LPS - Only the FDLP BBS on it

2) Share Project Hermes microcomputer - Run by LPS

3) Contract with Online Service (Profit or Non-Profit)

4) Use GPO Mainframe - Run by Office of Information Resources Management (OIRM) as service bureau to LPS.

The following tables show hardware and software configurations for each option, plus estimated costs. Data for option 4 were compiled by Technical Support staff in OIRM, based on an estimation that one quarter of the 1400 depositories would dial in on any given day and that each library would require between 30 and 60 minutes of connect time per day. (See Appendix E for additional data on the GPO mainframe.)

1. Dedicated microcomputer in LPS -
   Run by LPS - only FDLP BBS on it -

Staffing Costs	Low End	High End
1 FTE GG7/11 technician	$ 21,065	$ 39,985
Hardware and Software Costs to LPS		
IBM-Compatible PC	900	6,000
Backup PC	900	6,000
Modem	80	600
Expansion chassis with multiple internal modems	2,200	13,000
Rack mount cabinet	300	500
32 dedicated phone lines, $52 per installation	1,664	1,664
Removable hard disk	500	3,000
Backup removable hard disk	500	3,000
Uninterruptable Power Supply	200	800
Computer Fax card	300	600
BBS software	30	2,000
Printer	300	3,000
Totals for Hardware & Software	**7,874**	**40,164**
Set-Up Costs		
Contractor	2,000	5,000

Table 5. Considerations: LPS would be in control of the system; full back-up is provided in case of equipment or power failure. LPS has no experience in telecomputing and there could be a long learning curve. However, use of a contractor for set-up would provide LPS staff with the necessary expertise. Hardware and software costs could be high.

2. Share Project Hermes PC
Run by LPS

Staffing Costs	Low End	High End
1 FTE GG7/11 technician	21,065	39,985
Hardware and Software Costs to LPS		
32 dedicated phone lines, $52 per installation	1,664	1,664
1 dedicated phone line from LPS to Supreme Court	52	52
Printer	300	3,000
Totals for Hardware & Software	**2,016**	**4,716**

Table 6. Considerations: System set-up and maintenance would be performed by Production for LPS. Some loss of system control, no backup in case of system failure. Use of existing hardware and software would effect significant cost savings.

3. Contract with Online Service (Profit or Non-profit)
Run by organization as service to LPS

Staffing Costs	Low End	High End
1 FTE GG7/11 technician	21,065	39,985
Hardware and Software Costs to LPS		
IBM-Compatible PC	900	6,000
Modem	80	600
Telecommunications software	10	400
1 dedicated phone line	52	52
Printer	300	3,000
Totals for Hardware & Software	**1,342**	**10,052**
Set-up Costs		
Contractor	2,000	5,000

Table 7. Considerations: LPS would contract with an existing service and use its hardware and software to mount the FDLP BBS. LPS would benefit from the technical expertise of the contractor. LPS would pay for the service but would realize savings in hardware and software procurements.

Numerous online services exist that could mount the FDLP BBS on existing systems. The BBS Project Team investigated several existing services, some government-sponsored and some in the private sector. The Department of Agriculture bulletin board system run by Martin Marietta cannot accommodate 2-way communications and therefore would not be suitable for the FDLP BBS. The Cleveland Free- Net system and the NIH bulletin board system are possibilities. Other services mentioned by respondents include Palinet, ALAnet, Bitnet, Fedlink, and Compuserve. Some systems restrict their service to limited geographic areas or only to academic institutions. GPO could issue a Request for Proposals (RFP) to determine what online services could provide.

4. GPO Mainframe
   Run by Office of Information Resources Management (OIRM) as service bureau to LPS.

Staffing Costs	Low End	High End
1 FTE GG7/11 technician	21,065	39,985
Hardware and Software Costs to LPS	**Cost**	**Total**
Protocol converter	15,000	15,000
32 dedicated telephone lines, annual cost	240	7,680
Modems (2224 CEO)	525	16,800
Modem cabinet	2,000	2,000
32 cables	75	2,400
Bulletin board software	30,000	30,000
Printer	300	300
Totals for Hardware & Software		**74,180**

Table 8. Considerations: OIRM would provide system set-up and maintenance. LPS would benefit from technical expertise of OIRM. Costs are significantly higher than with other options.

F. Implementation Schedule

The BBS Project Team recommends that initially the FDLP BBS be limited to bulletins and E-Mail. Beginning with a simple format would allow the system managers and depository library staffs to gain experience with the system and to work out any "bugs."

Bearing in mind management directives that the system contain administrative information directly relating to the Depository Library Program, the team proposes that:

1) Initially, content be limited to E-Mail and time-sensitive bulletins, such as:
   - short notices from Administrative Notes;
   - notices regarding individual titles;
   - notices on new item surveys;
   - emergency notifications; and that

2) The system first be tested with the 54 regional libraries.

Each phase of the system would be tested for at least one month with regional libraries. The testing could be expanded to up to three months if necessary. When LPS and regional depository staff were satisfied that the BBS was functioning smoothly and when any necessary

changes in workflow and staffing were implemented, the system could be expanded. The expanded content could be tested with the regionals for another one to three months.

At the end of that period the system would be opened to all depositories. This gradual approach would allow LPS to assess the impact of the BBS on workflow and staffing.

Other functions and additional content could be added to the system as needed. LPS could load other files related to the Depository Library Program, insofar as they were automated.

Functions such as claims processing, the Biennial Survey, and item number surveys could be added later, after programs had been written to accommodate the data. As each function was added, it could be tested for one to three months with the regionals.

A tentative timetable for the project is as follows, assuming a one-month test for each phase:

Month 1	Content limited to short messages. Test with regionals.
Month 2	Add shipping lists. Test with regionals.
Month 3	Open to all depositories.
Month 4	Add claims. Test with regionals.
Month 5	Open to all depositories.
Month 6	Add new item surveys. Test with regionals.
Month 7	Open to all depositories.
Etc.	

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Appendix A

Depository Library Council Recommendations
Spring 1990

Recommendation 13: The Depository Library Council recommends to the Public Printer that the Library Programs Service investigate the costs and feasibility for implementing and maintaining an Electronic Bulletin Board (EBB) communication service. It is requested that the findings of this investigation be fully reported to Council at the October 1990 meeting.

Rationale: An Electronic Bulletin Board Service will result in the following benefits:

- timely notice to Depository Libraries of urgent information, such as computer virus, cataloging/ classification and publication alerts;
- reduction in costs, labor and miscommunication by replacing multiple telephone calls and/or mailings with one bulletin board message;
- provision of computer files, such as shipping list information or electronic court opinions; and
- assurance that messages are received promptly and at the convenience of the recipient.

Recommendation 14: The Depository Library Council recommends to the Public Printer that GPO join a universal access electronic mail service, such as Internet, to enable Depository Libraries which presently have or wish to obtain electronic mail (E-mail) capability to communicate interactively with one another and GPO.

Rationale: Increased interactive electronic communication among the Depository Libraries and between GPO and the Depositories will have the following benefits:

- reduces time lag for responses to inquiries;
- alleviates problems associated with time zone differences; and
- promotes more frequent communication, thus reducing problems by providing a mechanism to react quickly.

Appendix B

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Appendix C

Suggestions for File Content

LPS Staff Suggestions

- Administrative Notes
- special notices regarding specific publications
- urgent messages, such as the recent notice of computer virus contamination of CD-ROM software
- deadlines for item number selection cycles
- special item number surveys
- fugitive documents status
- item selection problems
- library inspections
- shipping lists
- Monthly Catalog's List of Corrections
- Monthly Catalog's List of Special Materials
- GPO Cataloging Guidelines
- GPO Classification Guidelines
- Instructions to Depository Libraries.

Suggestions from Respondents

Feedback from the surveys sent to Depository Library Council members and to the GODORT Government Information Technology Committee and other respondents included some far-reaching suggestions for an LPS bulletin board system. Suggestions for content of the BBS fell into two primary categories:

1) LPS-initiated messages and files, to be sent to all libraries with no response from them;

2) Inter-active functions, with both LPS and the depositories posting and receiving messages and files to accomplish tasks now performed manually.

In the first category, respondents suggested that LPS provide the following:

- Shipping lists
- Administrative Notes
- Short notices relating to publications
- Corrections to shipping lists
- Superseded documents lists
- List of GPO addresses and phone numbers
- List of Council members
- Council meeting locations and dates
- Library inspections
- List of Classes
- PRF (Publications Reference File)
- Union List of Items Selected
- Automated files of other Federal agencies
- Automated files within GPO's arena, for example, Congressional bills and the Congressional Record
- Full text of documents relating to the Federal Depository Library Program
- Congressional press releases
- Commercial data services, such as Legislate.

In the second category, respondents suggested that the following functions be conducted through the FDLP BBS:

- The Biennial Survey
- Claims processing
- New item surveys

- Item Selection List additions and deletions
- Needs and Offers Lists postings
- Classification and cataloging inquiries
- Inquiries on other aspects of the Federal Depository Library Program
- Forum for questions and answers among depository librarians
- Forum for notices from other documents groups
- Ordering Sales documents
- Central newsletter exchange
- Gateway for depository librarians to alert GPO to new applications and files for use on the BBS.

Extensive comments were sent by several respondents, as follows:

- Shipping Lists: Libraries would like to be able to download the shipping list and use it to print labels and maintain item files. To be useful in this way, the list must be available in a structured format, e.g. fields must be tagged or other indicators must be present so that downloading programs can distinguish SuDocs numbers from item numbers, from titles, etc.
- Needs and Offers: The list should be posted to the board and be searchable by SuDocs number, so that libraries can easily identify items they need. Ideally, it should be possible for libraries to download their discard lists to this file, so that LPS would not have to load them. If this is not possible, libraries would have to supply LPS with ASCII files.
- Status files: If GPO keeps, or will keep in the future, any status files of rainchecks, missing items, etc., in electronic form, it would be useful if these were posted to the bulletin board.
- Gateway: With the growing number of electronic bulletin boards in various governmental agencies, it would be valuable for the GPO board to serve as a gateway. If depositories could access this board and use it to get to other boards, depository libraries would not have to deal with multiple registrations, log-in procedures, bills, etc.
- It is essential that access to the bulletin board be via a network such as Tymnet, Telenet, or Compuserve. Requiring libraries to pay long distance charges to access the board will greatly limit its usefulness to libraries outside of the Washington, DC area.
- The system should be easy to learn and use, even for those not "computer- literate." Ideally, it should be totally menu driven.
- Software should be in common use, such as TBBS or RBBS.
- The testing period should be conducted simultaneously on two different platforms, to determine which was most cost-effective, efficient, and useful.

Appendix D

Alternate Technologies

In its investigations, the BBS Project Team discovered that there are many methods available for the transfer of information via electronic media. Each has strengths and weaknesses with respect to the ultimate goals of the project. The team felt that a discussion of these methods would be helpful to the decision making process.

In addition to BBS, the team considered the following four data transfer technologies:

- On-line Services
- E-Mail
- FAX
- Direct Media Dissemination

On-line Services

Online services provide a wide variety of services to their subscribers. In fact, they offer all of the methods of information dissemination investigated in the course of this study, with the exception of direct media. The key to their success is the economies of scale made possible by teaming a large, capable computer system with a national telecommunications network. This combination provides most users with fast, economical access to a large number of databases, E-Mail, gateways to other systems, online searches and other products. All this is available via local access phone lines. Most of the service providers have many sub-systems operated as bulletin boards, which are known by various names, covering various topics of interest.

Several commercial on-line services also offer Fax transmission service. For a fee, they will convert uploaded ASCII text files to Fax format and transmit them to multiple addresses/phone numbers. This can be done at a very competitive rate since these services have access to long distance service which sometimes is their own network. Delivery confirmation is provided to the sender. There is even a service which allows Fax replies. Replies can be directed to individual mailboxes for retrieval. The messages are converted to popular word processing formats. This technology limits transmissions to text, ruling out graphic images.

In addition to the services provided to the general public, private systems are also often supported, using the same facilities. An online service can create a private bulletin board to the specifications of its client, who gains access to the service's computer and telecommunications network.

In this way, clients receive the benefit of years of computer and telecommunications experience, along with the resources needed to handle high volumes of data traffic. The costs are spread over a large user base, reducing them to the individual user.

Advantages of On-Line Services

A. Long technical experience in the field with an established staff of experts. This would speed up the establishment of any BBS and avoid common pitfalls.

B. Usually, commercial services are part of a large corporate group possessing considerable financial and hardware resources. The latest, most effective technology is used.

C. Much of the work associated with the running of such a system would be done by the service, requiring less devotion of resources by LPS.

D. On-line services have established telecommunications networks, which would provide local access to most of the depository libraries and help reduce communications charges.

E. Technical support to the users, such as help with communications problems, providing booklets, user manuals, user software and training, is usually provided by the service, which would relieve LPS of this considerable responsibility.

Disadvantages of On-Line Services

A. The difficulty in creating and negotiating a contract, for the establishment of such a service with a private concern, is the principle impediment to the government.

B. There may also be problems in administering the BBS because of the remote location and because of misunderstandings arising from the differences between the government and a

private business. However, these services are used to accommodating their customers.

Analysis

Most of the online services offer bulletin boards, E-Mail, and Fax capability. A minimum investment from LPS would be needed from the standpoint of hardware and software purchases and staff time.

E-Mail (Electronic Mail)

The term E-Mail can refer to many things. In this context, E-Mail refers to the exchange of text files using a central computer service as an intermediary. This service provides account holders with electronic mail boxes. Other members of the service, and members of other connected services, can address messages to these mail boxes. The accumulated messages can be viewed and downloaded the next time the account owner logs on to the service.

In addition to the delivery of text messages to others on the service, E-Mail providers typically offer additional mail services.

Text can be transmitted to the location nearest to the recipient, laser printed, enveloped and mailed locally. Local U.S. mail is normally next day delivery. Using this method, even those locations without access to any online services can be reached by E-Mail. As mentioned in the section on Fax, E-Mail messages can be converted and transmitted as Fax documents as well.

While most online services have eschewed interconnection with their competitors, one service, DASnet, provides a bridging service to deliver E-Mail to most of the other online services. In this way, nearly all subscribers can communicate with each other using E-Mail. Delivery of messages within one service is almost instantaneous, while it may take a day or two to reach other services.

Advantages of E-Mail

A. E-Mail online services often offer a host of user options which allow custom tailoring to the needs of the sender and receiver.

B. A very large number of professional and technical organizations can be reached in this way. No doubt many depositories are clients to one or the other of these service networks.

C. Specifically addressed mail, as well as general broadcast messages can be sent easily.

D. The major service providers offer good customer support, including software which allows preparation of text off line before log on, and then automates the up load process.

E. E-Mail traffic could be routed to specific areas of LPS by the use of specific mail boxes. This structuring would provide some organization and pre-sorting of the material, reducing the amount of manual sorting that would otherwise be necessary.

F. Transmission of text via E-Mail is inexpensive and quick; much faster than U.S. mail service and very close in costs. Handling and labor costs are almost nil.

Disadvantages of E-Mail

A. E-Mail has only a limited capability to transfer data files. It has no ability to provide users with online reference information, in and of itself.

B. Generally, messages are limited to about 50,000 characters. This imposes a practical limit on the types of listings LPS could supply, or which could be exchanged between libraries.

C. E-Mail service lacks a focus for centralized communication and joint efforts. While E-Mail can certainly assist in these efforts, it does not accomplish the whole job.

Analysis

E-Mail has become an important tool in modern communications. However, it too has limitations with respect to LPS goals in meeting the needs of the Depository Library community. E-Mail technology can meet all of the four basic services LPS expects to provide, but only to a limited extent.

1) Bulletins - LPS could send critical bulletins to all or just the affected libraries, that have E-Mail accounts.

2) E-Mail - Fully supported.

3) Conferences - Message exchange between select groups is possible.

4) File Exchange - Some E-Mail services allow the

attachment of binary files to their E-Mail. There are also utility programs which convert eight bit binary files to seven bit, for transmission as E- Mail, and then reconvert them on the receiving end.

Despite the fact that E-Mail seems to meet all of the major objectives, it is a service that, by itself, is too weak in some areas, particularly with respect to data file handling, to meet the expressed needs of the depository library community.

FAX (Facsimile)

Fax transmission is one of the oldest methods of data transfer under consideration. Recent developments have lowered the cost of desk top Fax machines dramatically. Consequently, their use has grown tremendously over just the past few years. Individuals, commercial businesses, schools and government all use Fax extensively.

Fax is a method of translating an image to an electronic signal which can be transmitted over ordinary telephone lines, to any other location equipped with a Fax and a phone line. There are several types or groups of Fax machine. The earliest is the Group 1 Fax. This is no longer in use. Next is the Group 2 Fax which is still in use. The most common form is Group 3 Fax. Almost all of today's Fax machines are Group 3. There is also a Group 4 Fax which requires special digital transmission lines found in today's intelligent digital networks. These groups are distinguished by the method used to convert the image to be transmitted. Some of the more expensive Group 3 Fax machines can understand Group 2. Similarly, a few Group 4 machines can understand Group 3.

Transmission speed is another variable among Fax machines. With Group 3 machines, 4800 and 9600 baud are common transmission speeds. Faster transmission allows more information to be relayed in a given time period, resulting in reduced telephone charges. But, both Fax machines must support the higher speed in order to take advantage of it. And if there is a lot of line noise on the phone connection, transmission speed is automatically reduced. The higher speed Fax machines also cost more.

Advantages of Fax Transmission:

A. Fax machines are already in common use. The last Biennial Survey of Depository Libraries shows that most depositories already have at least one Fax available.

B. Fax machines are inexpensive to procure and relatively easy to maintain.

C. Both text and graphics, whether printed or hand-written, can be transmitted by Fax.

D. Some Fax machines can be programmed to "broadcast" to a predetermined set of phone numbers; and the transmission time can be set to occur at night when phone charges are lowest.

E. Confirmation of delivery is usually available from most Fax machines.

F. The resolution, or quality, of Faxed documents at the receiving end is usually adequate for most purposes.

G. There are Fax network services available which can reduce the cost of transmission and improve quality.

Disadvantages of Fax Transmission:

A. The cost of transmission of a great deal of data, to so many locations, while low compared to printing and mailing costs, is still considerable.

B. Fax does not provide a central focus of communication. While it would allow communication between libraries and between LPS and the libraries, there is no central repository for all this information. Centralized coordination of efforts would be difficult.

C. Multiple Fax machines would be required at LPS to handle the level of expected data traffic. Each machine would have to have a dedicated line. Though transmission would be faster, the received documents would have to be manually sorted and routed to the appropriate people, as with the current postal service delivery. Considerable effort would be required to ensure that each issuance was transmitted and received by all depository libraries.

D. The most limiting factor is that Fax transmission cannot deliver information in a usable, electronic format. All data would have to be re-keyed or scanned into a computer, before it could be used in an automated environment.

Variations on the basic Fax arrangements exist. They can help to mitigate some of the limiting factors outlined above, but at a cost. Each form is outlined below.

The first intriguing possibility is the PC Fax board. This is an option card which is installed inside an IBM compatible computer, together with suitable software. It provides the computer with the ability to send and receive Fax transmission to Group 3 machines just like any ordinary Fax machine, with two important differences. First, Fax documents received are saved to disk as image files. These can be either printed as a graphic image, or interpreted by OCR (optical character recognition) software, and converted to ASCII text. Second, ASCII text files in the computer can be converted to Fax format for transmission. In addition, paper documents can be input using a scanner, and then transmitted as Fax documents.

Use of this technology could improve the control of information dissemination on the LPS side through centralization, but would require an additional computer devoted to this role. The demands of such Fax hardware/software would require a relatively sophisticated computer system. Also, a high speed scanner and printer would have to be available.

Analysis

There is no question that Fax technology offers an important tool in national and international communication. It does have limitations with respect to LPS goals in meeting the needs of the Depository Library community. Fax technology can provide three of the four basic services LPS has identified as important.

1) Bulletins - LPS could broadcast critical bulletins to all or just the affected libraries, if they have Fax machines.

2) E-Mail - In a sense, Fax can transmit mail to individual libraries, allowing private messages back and forth.

3) Conferences - Again, message exchange between select groups is possible.

Exchange of long lists, data files, programs and so on is not possible with Fax technology.

It would seem that Fax has a place in GPO's efforts to improve communication with and service to the Depository community, and may provide a bridge to those libraries that do not now possess the more advanced technology to take advantage of other services. LPS now has two Fax machines with which it communicates one-on-one with depositories.

If LPS were to increase its use of Fax technology, it could configure a computer with a Fax option card. An 80386 IBM compatible computer running under a multi-tasking operating environment could support several Fax cards at a time. Each card would be capable of multiple Fax broadcasts. The advantage of this arrangement would be the consolidation of the many files and messages at one point. In addition, conversion of the Faxed images to a usable ASCII format would be possible.

Direct Media Dissemination

Another alternative to consider is direct media dissemination. Already, the Depository Library Program is distributing government data on CD-ROM and floppy disk. The Federal issuing agencies determine when to use these formats. LPS could have its published products produced in the same manner. There are several factors which must be considered before embarking on such a course. In any case, direct media distribution would only be suitable in specific cases.

Advantages of Direct Media Dissemination

A. Production, content, format and frequency of distribution could all be controlled by LPS.

B. There would be no need to establish any other platforms or agreements with outside commercial organizations for distribution, since LPS could employ its current physical distribution system.

C. For products which would be best presented as a complete package or set, direct distribution would be suitable. LPS could provide documentation and any supplemental materials along with the media.

D. For volume distribution, CD-ROM and floppy disks could be produced and distributed at low cost.

Disadvantages of Direct Media Dissemination

A. The timeliness of information delivery would be no better than with paper products. In fact,

there might be an additional delay due to the time involved in production of the document.

B. There would always be a possibility of damage or erasure during shipment, requiring replacement of the product. This would cause additional delays.

C. If errors in content were found within already distributed media, the only way to correct it would be by replacing the product. This would multiply costs greatly, depending on the frequency of these errors, and add an additional delay.

D. Direct media dissemination would not be suitable for all the products LPS would want to distribute. CD- ROM and floppy disk are too large as storage media for small files. Processing routine message replies from all of the depository libraries in these formats would result in an additional work load for LPS. Since the messages would be in electronic format, there could also be a savings of effort in some cases.

E. Adoption of direct media dissemination would impose additional standards on the library community for media formats. While this might be desirable, it must be recognized that with such a diverse group of libraries, differences in equipment capabilities exist.

Analysis

Outside of certain situations, the use of direct media dissemination would not meet LPS goals to provide service to the library community.

1) Bulletins - Impractical, except as a compilation of past issuances.

2) E-Mail - Possible, but with the volume expected, cumbersome at best.

3) Conferences - Not possible.

4) File Exchange - A very good possibility, bearing in mind the limitations already stated above.

Direct Media Dissemination Hardware and Software

The field of Authoring Systems is a relatively new and exciting area of microcomputer development. Depending on the media chosen, much if not all the necessary pre-mastering work can be done on a suitably equipped microcomputer. However, it must be recognized that the use of such systems involves a steep learning curve. Their complexity cannot be mastered by anyone without experience, overnight. With the necessary investment in software, equipment and skill development, many exciting products could be produced to benefit the depository community.

There are also systems available for mass production of floppy disk products. Some systems capable of producing small quantities of CD- ROMs are now becoming available also. The costs of production equipment for such a relatively small audience seems prohibitive however. And GPO already has systems available that LPS could use if necessary.

Useful distributed products could be produced with the software LPS already possesses. Of particular note is the available Run Time system for FoxPro. FoxPro is a dBASE development language and environment, capable of producing elaborate turn-key systems. The Run Time is a database engine which will run application program code once it has been created and compiled by FoxPro. Copies of any application produced by this system could be duplicated and distributed in any quantity, without restriction.

It can be assumed that many of the depository libraries have one or another of the various programs capable of using dBASE data files. In addition, they can be converted to "Standard Delimited Format", for transfer to most other major software types. Documents produced by any of the word processors in use by LPS, can be converted to ASCII and imported into other major types in use by our depositories. In this way, a good deal of information available in LPS could be distributed to the depository community on CD-ROM and floppy disks.

Appendix E

Hardware and Software

Computer

Definitions

The computer field is changing at such a rapid rate that exact definitions are sometimes difficult. What may be true about a certain class of computers today, can change tomorrow. In broad terms, computers can be divided into general purpose and dedicated or specific purpose computers.

Only general purpose computers can be used for a BBS. General purpose computers fall into three groups according to general size, use and capabilities:

- Mainframe
- Mini
- Micro

These groups are very generalized, and there is so much overlap between them that the distinctions blur.

In the field of computer-to-computer communications, mainframes are often operated as the central source of data files. They maintain vast amounts of data online; can support many users simultaneously, and have high speed connections to other mainframes, to provide the user with many resources not contained in a single system.

Minicomputers are generally physically smaller and have less mass storage capacity than mainframes. They function much the same as the mainframes, and in addition, they provide support services such as operating the nodes of public data networks. Office work groups are also built on minicomputers, as are research establishments and universities, through connections to dumb terminals.

Microcomputers or PC's (personal computers) are the most numerous and popular type of general purpose computer. Prices allow many individuals access to a microcomputer. Microcomputers can, but generally do not, support multiple users.

PC's can generally be grouped based on their MPU (microprocessor unit) type:

- INTEL 8086 family
- MOTOROLA 68000 family

The Intel family is called IBM compatible if it can run under the MS-DOS operating system. Computers are built around the 8086/8088 (XT class); 80286 (AT class) and 80386/80486 microprocessors. Each successive generation of processor provides additional capabilities which translates into improved communications and other abilities.

The Motorola family includes computers that are built around the Motorola 68000, 68020, 68030 microprocessors. Chief among them are the Apple Macintosh computers. Again, the more advanced processors provide improved performance to the computer.

These two families of computers are not software compatible, but they can communicate with each other, if communications protocols agree. This is one way of bridging the gap between these two types of microcomputers. The 1989 biennial survey shows that the majority of depository libraries have IBM compatible computers available; therefore that family should be the main focus for the FDLP BBS.

Still, microcomputer communications are flexible enough, that good service could be arranged for Macintosh computers as well.

Computer systems are made up of various sub-systems. These are:

- Microprocessor (the brain of the computer)
- Main memory or RAM memory
- I/O (input/output systems)
- Mass storage (hard disk or floppy)

The degree to which each of these sub- systems operates in computer to computer communications depends on the exact application. Generally, if the computer is to do more, each of these sub-systems must be increased or enhanced.

For example:

If a computer system were expected to handle 25 users and each of these users were provided a file area of two megabytes, that would be 2 X 25 or 50 megabytes of hard disk space. In addition, the system would need approximately 10 megabytes for system files and a 10% fudge factor. So the total needed hard disk

system space would be 66 megabytes. If the number of users was increased to 300, the total would be 670 megabytes of hard disk space.

Operating system memory requirements are typically 640k, plus extended or expanded memory (the memory above the 640k DOS limit). The expanded memory is used to support each activity or user. A certain amount is set aside for each task, therefore the total amount of memory needed would be governed by the number of tasks or users expected to be supported.

The type and speed of the microprocessor is also important. Since system resources are allocated by time slice, the faster the processor runs, the less the delay in performing a task when there are multiple users or multiple tasks involved.

The type of computer and other hardware needed to meet the needs of the LPS, is directly related to what will be expected of it. Costs increase in direct relation to capabilities, although after a certain point, a system can be substantially improved with a proportionally small increase in cost.

As examples:

A ESDI hard disk of 150 megabyte capacity might cost $1500. To purchase a 300 megabyte disk does not double the cost. The cost is around $2000. So cost per megabyte of storage in large capacity drives goes down, as size goes up.

Similarly, an 80386 computer operating at 20 Mhz speed might cost $3500. A much faster 80386 operating at 33 Mhz might cost $4500 or just $1000 more. The performance increase is analogous to going from an old XT to the 80386 20 Mhz computer.

Telecommunications

A telephone line connection is the most usual mechanism for computer-to-computer communications outside of a building. If an RJ11 type plug is available, anyone can connect the phone line to the modem. For low level traffic, a voice and modem use line is possible. Most modems have an in and out plug to allow the phone to be chained on the same line. However, it would be better to have a line that is dedicated to the modem alone. The phone company must be contacted to install a dedicated phone line. In a high-use system, multiple lines are required. A rule of thumb is one line to fifty active users, depending on how often they call, when they call, and how long they stay on the line uploading and downloading data. In a multi-line system, several users can log on simultaneously by calling a single phone number. Calls are routed to several modems on an add-on board or to multiple external modems linked to serial ports. Arrangements can be made with the phone company and with the PBX installers to be able to split incoming calls to one number to multiple lines.

One significant consideration regarding phone lines is telecommunications costs. Long- distance phone company charges could add up very rapidly, and many of the libraries with meager budgets might be unable to participate in the system if they had to pay these charges. If the FDLP BBS develops so that almost all important LPS communications take place on the bulletin board, paper transmission gradually being phased out, the less well-financed libraries might be severely impaired in their ability to participate in the Federal Depository Library Program.

Traditionally LPS has paid all costs associated with transmitting information to the libraries. Transmitting information via phone lines is functionally no different than transmission of hard copy through the postal service. If LPS were to pay the tele-communications costs, a toll-free 800 number could be installed. Costs to GPO might be prohibitive, however.

Costs could be reduced by contracting with a public data network, or PDN. These are also commonly called "packet switching networks." Some of the best known are Telenet, now called SprintNet, and Tymnet, but there are many others.

These networks can provide substantial savings compared with using the normal telephone network. The reason PDN's can provide service for less is the efficiency with which they can communicate. This has to do with the nature of digital communications as compared with voice communications. In most areas of the country, these networks maintain what are called "nodes." These nodes provide local access numbers that users of the network can call without incurring long distance charges.

When a user calls the local node, a modem answers the call. The nodes computer asks the caller for the address of the computer the user wishes to communicate with. Node computers constantly monitor the conditions on several high speed data transmission lines that the network maintains. The incoming digital data is compressed into packets of 128 bytes each, using the X.25 protocol. Each of these packets is addressed with the destination and numbered in sequence. The

computer then routes each packet separately, depending on the volume of data traffic on each high speed line. During high traffic times, each data line can be completely filled, resulting in the most efficient use of the system. Packets can travel independently to their destination because they contain digital information. This is not possible on analog phone lines.

When the packets arrive at the destination node, the nodes computer reassembles them in the numbered order and transmits them over another modem, to the addressee. The network computers record users by an ID number and password. Depending on the arrangement, either the sender or receiver is billed for the time connected. Because of the many redundant connections, the network system is very reliable.

Telephone connections can be provided by a toll-free 800 service, if it is decided that LPS will pay communications charges. A PDN feed could be paid for by either GPO or the users, or by a combination of the two. Otherwise, normal business lines would provide access to long distance callers, who would pay the charges.

Modem

When computers must communicate further than the local area (within a building), a modem (short for modulator-demodulator) is used. Modems are critical pieces of equipment which are rapidly evolving as technical improvements are made. Selection of an adequate modem is crucial to the successful operation of a BBS.

The function of a modem is to make it possible for computers to communicate with each other over the phone lines. Computers communicate by digital signals. Telephone systems are designed to carry analog sound, not digital signals. The computer signal is made up of discrete voltage conditions, representing the 1's and 0's of the binary language. Modems convert this digital signal to tones or sounds of specific frequency, for transmission over the telephone lines. They also act in reverse, for signals being received from other computers.

Modems operate at various transmission speeds and sometimes incorporate transmission protocols. Originally, modems had to transmit at very slow speeds (150 - 300 bits per second, or baud) because the signal noise in the phone lines could cause errors in the information being sent. With the exception of special conditioned leased lines, most telephone lines still have noise, but various transmission protocols have been developed which check the data for transmission errors, and correct the errors when they are found.

There are also protocols for the automatic compression of data before transmission, to speed up the data transmission rates. These various protocols go by names like MNP (Microcom Networking Protocol), X.PC, V.22, V.32, V.42. The problem with these standards is that both the sending and receiving modems must support the standard, in order for it to work, and by no means all modems support these protocols.

While only a few years ago 1200bps (bits per second) was considered high speed transmission, today 2400bps and even 9600bps is considered commonplace. The advantage of higher transmission speed is that the time spent connected online is reduced, resulting in lower charges. Large file transfers that take place quickly can reduce costs significantly. Again, both modems involved in the communication must support the same speed or the faster modem will drop to the speed of the slower one.

Modems are rapidly becoming cheaper, faster, and easier to use. Most advances are taking place in the 2400 and 9600bps technology. Slower modems are dropping in price but are not improving technologically.

The adoption in 1989 of a new standard (v.32) for the 9600bps modem by the Consultative Committee on International Telegraph and Telephone should spur industry acceptance of the 9600. The 9600 would be ideal to send and receive large amounts of data all day.

To communicate with a mainframe computer, synchronous as well as asynchronous communication capability is required. If projections for future uses of the FDLP BBS include downloading files from GPO's mainframe, a modem with synchronous as well as asynchronous capability should be chosen.

Another alternative is a special expansion chassis that holds multiple internal modems. Galacticomm's Galactibox comes with 16 expansion slots, and up to four boxes can be chained together, for a total of 64 ports. A 16- port Galactibox is installed on the Project Hermes platform.

Software

Once the hardware requirements are met and the computer, modem, and telephone line are connected, all

that remains to complete the bulletin board system is the software. If an existing service is used, only telecommunications software will be needed. If LPS designs and maintains its own system, BBS software must be purchased.

Communications Software

A communications software package is a type of application program, just as word processing and spreadsheet programs are. Communications programs are designed to give users control over their computer communications sessions. To do this, they offer a variety of features and options. The control of the various settings, a phone number list for automatic dialing, file transfer control, and various printing options are among the features commonly found in communications programs. Differences in the number and type of features offered is the chief distinction among the various available programs. These programs are available as public domain software, that is, free of any copyright restrictions, or they can be elaborate commercial products. Some of the more popular communications programs are: SmartCom, ProComm, and Crosstalk. There are many others available.

A significant feature of many communications programs is the creation and use of "scripting" or programming of automatic sequences for log on to online services and BBS, and for retrieval of routine data from these systems. The most common programs offer a form of control over the modem by using the Hayes "AT" command set, or a subset of this set of commands first used to control Hayes brand modems. Modems that support this command set are therefore able to operate with many communications programs.

With modems now available that operate at high transmission speeds, above 300bps, errors in data transmission due to line noise are common. To combat this, various error correction methods were developed. One of the first error correction protocols was Xmodem. Other improved versions such as Xmodem-CRC, Ymodem and Zmodem, have followed. Kermit, another long-time popular transfer protocol, was developed for UNIX mini-computer system transfers and has become generally popular as well. Both the sender and receiver programs must be using the same protocol in order for it to work. An advantage of today's good communications programs is that they support several of the most popular protocols, making it likely that a match can be found.

BBS Software

There are many versions of BBS software available, both relatively expensive commercial versions and "shareware" that is available at a usually very modest fee.

Desirable features in BBS software include:

- support high speed modems;
- support Xmodem and Ymodem protocols;
- support batch file protocols such as Kermit;
- support external protocols;
- flexible security system;
- ease in message editing and retrieval;
- support network mail;
- support multiple lines.

The software should be accompanied by complete, easily accessible documentation. Ease of use, ease of maintenance, and good product support are also important considerations.

BBS software comes with default settings for preset menus and commands, but the bulletin board managers would want to customize the system design to fit specific needs. For example, interface menus can be created to make it easy to navigate through the system, or certain areas of the BBS could be set aside for special interest groups. In the FDLP BBS, areas might be set aside for communication only with Depository Library Council members, or only with regional librarians.

Customizing BBS software appears to be a less user-friendly process than working with word processing or spreadsheet software. With BBS software, the sysop (system operator) must go through the BBS text editors, which may be unfamiliar and unfriendly terrain for the inexperienced person. Setting up BBS software requires a bit of technical expertise and there are on-going maintenance and trouble shooting tasks requiring someone to act as system administrator. If the decision is taken to create the BBS within LPS, one option for setting it up would be to contract with an independent specialist in this field. The contractor would design the complete system to LPS specifications and provide support during the testing phase.

Printer

To support the printing operations, a high speed dot matrix or laser printer would be needed. A high speed dot matrix printer using fan fold paper, should be adequate for the printing tasks. If printing becomes a delay causing task, both software- and hardware-implemented print buffers are available. Print buffers contain the document or file to be printed, and pass the coded information to the printer as fast as it can take it, thus freeing the computer for other tasks.

Hardware Recommendations

The BBS Project Team recommends that a dedicated computer be provided for the BBS. This computer should be capable of high speed processing of the information, particularly data files, and it should be equipped with a hard disk large enough to hold all the expected files, plus some extra space. A 70 to 100 megabyte drive should be sufficient. Most drives of this size are also fast responding and therefore would not add to transmission delays on upload or download of files. The 80386SX or 80486 computer running at 33 Mhz or better would be ideal for the FDLP BBS. (Project Hermes uses a 486/25MHz computer.)

The computer should also be equipped with floppy disk drives in both the 5¼" and 3½" formats, to support the drives in use in LPS. It would also be helpful to have two drives in the 3½" format to speed the process of making multiple copies to go to different points in LPS.

A duplicate backup computer system should be available to ensure uninterrupted service in the event ofhardware failure. In addition to the primary microcomputer and the backup microcomputer, with all their ancillary hardware and software, another microcomputer would be required to provide support for the BBS, i.e. preparing the files for transmission.

File information should also be routinely backed up to a separate medium, floppy disk or tape, to prevent loss in case of equipment failure.

Due to the large number of expected participating libraries, the BBS would need to support up to 32 users at a time. Installation for support of 25 users would give a good indication of any need to expand capacity. Support for 25 simultaneous users requires a computer capable of multi-user operation. The 80386/80486 microprocessor based computer can do this. Sufficient RAM memory would also need to be installed, to support this level of activity. Four megabytes would seem a good starting point. For file handling, a fast responding hard disk of no less than 100 megabytes should be provided.

In addition, these systems should be provided with an Uninterruptable Power Supply (UPS) so that power transients would not disrupt transmissions. Also, a file backup medium should be provided in the form of a streaming tape, bernoulli box or removable hard disk cartridge. Transfer of large files to and from the BBS system might be simplified with the use of removable hard disk cartridges.

Costs

The chart below shows the range of costs for essential and ancillary hardware and software for a BBS system, as well as estimated contracting and telecommunications costs.

Hardware	Low End	High End
IBM compatible computer	$ 900	$ 6,000
Modem	80	600
Expansion chassis with multiple internal modems	2,200	13,000
Rack mount cabinet	300	500
Removable hard disk	500	3,000
Uninterruptable power supply	200	800
Dot matrix printer	300	3,000
Laser printer	1,000	3,500
Computer fax card	300	600
Stand-alone fax machine	300	1,500
Scanner	400	4,000
Totals	**6,480**	**36,500**
Software		
BBS software	30	2,000
Telecommunications software	10	400
Scanner software	300	3,000
Totals	**340**	**5,400**
System Design		
Independent contractor	2,000	5,000
Online Services		
Hourly telecommunications charge	6	20

Table 9.

GPO Mainframe

[Information from Technical Support staff, Office of Information Resources Management, GPO]

The following is a description of the basic hardware and software requirements necessary to establish a bulletin board on GPO's mainframe computer for the distribution libraries. The estimates are based on 1,400 libraries dialing into GPO, with an estimation that ¼ of them will be dialing in on any given day and will require between 30 and 60 minutes of connect time to process their requests. Initially 32 lines would be installed to handle this traffic.

An extensive survey of mainframe bulletin board software was not conducted for this estimate. IBM's GROUPTALK software is used as a sample. Specific user requirements will have to be matched against software capabilities to ensure that software is available to meet the user needs. Since the bulletin board software will reside on the mainframe, it is assumed the package would require 3270 communications. This could be either Systems Network Architecture (SNA) or Bisynchronous EBCDIC communication. The main point is that the software will not communicate directly with a personal computer and protocol conversion will be required.

Two possible solutions are presented. The first utilizes hardware protocol converters similar to the method that external agencies and contractors use to access Printing Procurement information. The second establishes an X.25 asynchronous network for dial in users and performs the protocol conversion with a software package on the mainframe.

Method 1 - Hardware Protocol Converters:

A protocol converter acts as an interface between asynchronous, ASCII devices and SNA or bysynchronous devices. PC's perform dial in functions by use of a communications package such as CROSSTALK or PROCOM. The communication package emulates a common asynchronous device, such as a VT100, and performs the dialing and connection functions required to establish communications. Script files can be set up so the entire connection sequence is initiated by a single command. The user dials into the protocol converter and establishes a session with the host computer. The PC will appear to the mainframe as a 3270 device.

Basic requirements and approximate prices:

Item	Quantity	Cost	Total
Protocol converter	1	$ 15,000	$ 15,000
Telephone lines	32	240/yr.	7,680/yr.
Modems (2224 CEO)	32	525	16,800
Modem Cabinet	1	2,000	2,000
Cable	32	75	2,400
Bulletin board software	1	30,000	30,000
Total			**$ 73,880**

Table 10.

Note: This assumes the libraries will obtain their own communication software for their PC and the telephone lines will be local lines - which will be a long distance call for most libraries.

Method 2 - X.25 Network:

An X.25 network provides connectivity for diverse types of equipment. This is the type of network that is used by public networks like Tymnet and Telenet. Their services could be used to provide remote PC users dial in access to GPO's mainframe or a private X.25 network would be established at GPO.

The library user would again use a communications software package on the PC to establish a connection with the network. The data would be transmitted to the host in ASCII format and a software package would provide conversion to EBCDIC. The data would then be passed to the bulletin board application.

Basic requirements and approximate prices:

Item	Quantity	Cost	Total
X.25 pad	1	$ 3,000	$ 3,000
Telephone lines	32	240/yr.	7,680/yr.
Modems (2224 CEO)	32	525	16,800
Modem cabinet	1	2,000	2,000
Cable	32	75	2,400
4 port expander modules	8	700	5,600
X.25 software (COMTEN)	1	4,000/yr.	4,000/yr.
NPSI software (COMTEN)	1	2,400/yr.	2,400/yr.
Bulletin board (Host)	1	30,000	30,000
Protocol conversion software (Host)	1	40,000	40,000
Total			$113,880

Table 11.

Note: If mainframe bulletin board software is available to communicate directly with ASCII devices, the cost would be reduced to $73,880.

Cleveland Free-Net Community Computer System

The Cleveland Free-Net Community Computer System, a very large, multi-file, multi-use system, with thousands of users nationwide, could be used by GPO to implement its proposed BBS. Its founder, Mr. Tom Grudner of Case Western Reserve University in Cleveland, Ohio (where the system is headquartered) envisions the system as the "National Public Radio" of computer network systems. GPO could occupy a segment of the system, becoming a Special Interest Group, or SIG. The system allows for, or is currently being upgraded to accommodate, all anticipated LPS uses of a BBS: listing large text files for libraries to download, electronic mail, open forum discussion bulletin board segments, mass "mailings," etc.

Many libraries access Cleveland Free-Net through Internet. Internet is a system established among major universities for a variety of telecomputing uses. Neighboring institutions, such as depository libraries, can be allowed access to a university's Internet line(s). Therefore, most if not all depository libraries in the Federal Depository Library System could access the FDLP BBS on Cleveland Free-Net, through Internet. Cleveland Free-Net can also be accessed by a number of other methods: direct dial, other telecomputing systems, etc.

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